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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,321	08/30/2001	Stuart A. Sanders	01 - 414	8735

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EXAMINER

JACKSON, ANDRE L

ART UNIT	PAPER NUMBER
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3677

DATE MAILED: 06/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/943,321

Applicant(s)

SANDERS ET AL.

Examiner

Andre' L. Jackson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 16 is/are allowed.
- 6) ☒ Claim(s) 1-15 and 17-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4-14 and 17-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,388,959 to Forrester et al in view of EPO 939143 to Scheckenbach. Forrester et al discloses an annular abradable seal for use in a gas turbine engine comprising a seal substrate (22) and an abradable seal material applied to a bond layer (42); the abradable seal material being composed of a densified epoxy foam; and an engine component adapted for motion relative to the seal assembly and having an abrasive portion of the engine component and the abradable seal material of the seal cooperate to provide sealing. However, Forrester et al does not specifically disclose that the abradable seal material is composed of a densified polyimide foam as claimed. In the disclosure of Forrester et al (col. 1, lines 13-31), Forrester et al explains that it is well known within the art to have an abradable seal layer of a seal substrate composed of an epoxy resin including polymer components. Forrester et al goes as far as to state that abradable layer may have a structure therein made from a polyamide material. As to the statements presented above, Scheckenbach has been cited and teaches high temperature polymer coatings for use as an abradable seal layer of a substrate associated with a gas turbine engine (pg. 6, lines 50-58). The coating material if desired can be polymers or polymer/metal mixture modified through curing steps, one such step may be a thermal densification of the coating (pg. 7, lines 1-

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5). Further, Scheckenbach teaches that the polymer coatings bonded to a seal substrate provide stability at high temperature, good adhesion characteristics, increased strength and improved resistance to erosion, wherein examples of such high temperature polymers are polyimides, polyamide, polyester plastics and the like (pg. 5, lines 1-10). Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant's invention for the annular abradable seal of Forrester et al to have a densified epoxy foam composing a polyimide material, since the Examiner takes the position that polyimides, polyamides, polyester plastics and the like are equivalent for their use in an abradable layer of an air seal as evidenced by Scheckenbach and the selection of any of these known equivalents provide stability at high temperature, good adhesion characteristics, increased strength and improved resistance to erosion of a seal, and would be within the level of ordinary skill in the art.

As to claims 4-6 and 19-21, Forrester et al discloses that the epoxy foam has a density of 25 pounds per cubic foot.

As to claims 7 and 22, Forrester et al does not disclose shear strength of the epoxy foam within a range of 140 psi to 325 psi, however, it would have been obvious to one having ordinary skill in the art at the time of applicant's invention to modify the seal assembly of Forrester et al, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges as claimed involves only routine skill in the art.

As to claims 9, 10, 13 and 14, Forrester et al discloses a stator casing (10) affixed to the seal substrate, which provides an annular surface, which is disposed between tips (26) of fan blades (28) of a rotor (30). See column 2, lines 40-45.

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As to claims 11 and 18, the epoxy foam is a thermo-mechanically densified foam. See column 3, lines 9-37.

Claims 3 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forrester et al in view of Scheckenbach and further in view of USPN 3,834,001 to Carroll et al. Forrester et al as described above, includes a bond layer of densified epoxy foam disposed at a seal face or an inner annular surface, but Forrester et al does not disclose a seal substrate comprising a plurality of layers of densified epoxy foam. Carroll et al teaches a seal element (22) usable as a seal in a turbo-machine. The seal element includes a radial extending inner seal face (24) and rear face (26). Sheets or layers (27) are stacked and bonded to one another with their edges at the seal face and rear face respectively. Each layer includes a laminated plane (28) arranged perpendicular to an engine wheel. The seal structure providing a low density, which may be abraded without undue damage to structure which comes in contact with it. Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant's invention to modify the seal assembly of Forrester et al to include multiple laminate layers as taught by Carroll et al to provide an abradable seal having a low density and good resistance to structure which comes in contact with it.

#### **Allowable Subject Matter**

Claim 16 is allowed.

### **Response to Applicant's Arguments**

Applicant's request for reconsideration and submission of an Appeals Brief filed January 14, 2004 has been carefully reviewed and considered. Upon review of applicant's remarks presented in the appeals brief, review of applicant's application (disclosure) and reconsideration of the prior art, finality of the rejection of the last Office Action is persuasive and, therefore, the finality of that action is withdrawn.

However, in light of applicant's remarks with respect to claims 1-15 and 17-24, these arguments are moot in view of the new ground(s) of rejection presented in this Action. EPO 939143 A1 to Scheckenbach has been cited and used in combination with Forrester et al to provide an enhanced clarification of an obvious-type rejection of applicant's pending claims.

Accordingly claims 1-15 and 17-24 remain unpatentable over Forrester et al in view of Scheckenbach and further in view of Carroll et al.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andre' L. Jackson whose telephone number is (703) 605-4276. The examiner can normally be reached on Mon. - Fri. (10 am - 6 pm).


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy J. Swann can be reached on (703) 306-4115. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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